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# ***Critical Analysis on Construction Workforce Sustainability in Developed Economy***

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## **Abstract**

The construction industry in the developed economy has suffered a shortage of workforce which triggers project cost escalation and project delay and suppresses the whole economy. This paper aims to explore the perceptions of the general public and construction workers towards workforce shortage in the Hong Kong construction industry and identifies the critical factors affecting their intention to join the industry. Triangulation approach was adopted in this study and a street survey was conducted at grass-root areas in Hong Kong. Questionnaire was formatted using a five-point Likert scale and semi-structured interviews with ten experienced workers were used to validate and interpret the results from the street survey results. The triangulation approach yielded that “harsh working condition”, “job instability” and “lack of career prospects” are the primary barriers dissuading the public to join the construction industry. This paper provides insights into the critical factors affecting the construction workforce supply and extends to identify possible solutions for maintaining sufficient workforce.

Keywords: sustainability, public policy, recruitment

## **1. Introduction**

Construction industry is important in affecting countries' economy. The value added aspect of construction is between 5% and 10% of the gross domestic product (GDP) in highly developed countries and between 3% and 5% in developing countries (Lowe, 2003). It also accounts for a significant share of the workforce market in the economy (Agapiou et al., 1995). Essentially, construction process needs a large pool of workers

with different specialised skills to satisfy the increasing demands from the public needs. There are many evidences from various parts of the world that construction workers do not view their employment as a favourable light. Construction is always deemed to be a low-status job in most developed countries. For example, Spain receives difficulties in recruiting new construction workers in 2009, especially young people, despite 12% unemployment in the economy (Ahonen et al., 2009). A similar situation can also be found in the United Kingdom, where attracting youngsters to join construction industry and forcing a drive to recruit alternative manpower (e.g., women and ethnic minorities) are difficult tasks (Bowen, 1996). The questions of “why the general public does not join the construction industry” become one of the essential questions before formulating the workforce training policy.

The construction industry is labelled as a large pool of workers with diversify skills. There are over 60 skilled trades, such as concreter and scaffolders (Hong Kong Construction Workers Registration Authority, 2010). The skilled operatives invariably worked in small gangs and undertook an independent set of tasks, which were of different duration and levels of complexity (Dabrah and Ofori, 1997). Another major challenge faced in the construction industry arises from the need to maintain a sufficient skilled and competitive workforce (Rowings et al., 1996). It is also imperative to nurture and retain a workforce capable of, and committed to, delivering high-quality construction products if the overall performance of the construction industry improved (Hong Kong Construction Industry Review Committee, 2010).

Arditi and Mochtar (2000) also provided numerous studies which showed that poor quality emanated from the scarcity of an appropriately trained workforce, which was caused by inadequate levels of training, in addition to the poor quality of training provision. Prolonged shortage of a skilled workforce not only threatens the competitiveness of the whole economy but also creates inflationary pressures within the labour market, skills gap, deficiency in proficiency, overstressed workforce and avoidable injuries and deaths.

The first comprehensive study on perceptions of the construction workforce in the United States can be traced back to Rowings et al. (1996). They have conducted a survey for the career perceptions and job satisfaction of the construction workers through the use of questionnaires. In addition to the consideration of the United States economy and her situation, they have offered a number of recommendations in retaining the construction workforce. Today, in such developed regions and countries as Hong Kong and Singapore, the ecology of workforce has been changed and reliant to skilled tradesmen (Harris and McCaffer, 2013). The report issued by the Hong Kong government also stated that Hong Kong has been suffering construction workforce shortage since early 2012 (Hong Kong Government, 2012), which in turn negatively affects the competitiveness of the entire economy system. This study generates new and updated perceptions on the construction industry from the viewpoint of workforce. It can provide government and local training authorities with a new insight into the deployment of the policy associated with the workforce sustainability of the whole construction industry in the new century.

## **2. Workforce sustainability**

Sustainability has a broad definition, and is viewed as the ability to continue established behaviour or goal indefinitely (Gatto, 1995). With this perspective, workforce sustainability is defined as the capacity to maintain, support and endure the demand for and supply of construction personnel of a specific skill trade in this paper. However, there is a widespread consensus that a low-paid, unstable and dead-end job would be swept away by knowledge-based economy. This type of job would be replaced by well-paid and secure jobs that were connected to the pathways of upward mobility (Tilly, 1997). Construction has long been perceived as a low-status job and provided an employment opportunity for those who possess limited education or skill (Naidu, 1999). The low status has acted as a trigger for producing a widespread anxiety about how to maintain the workforce sustainability.

### **2.1 Factors influencing the demand for construction workers**

#### *(a) Amount of work*

Previous studies focused on estimating labour demand by pursuing the relationship between employment level and industry output (Sing et al., 2012a). Construction output is expected to have a positive effect on employment. Large amount of construction investment will lead to additional workforce required for the industry.

#### *(b) Degree of mechanization*

Degree of mechanization and automation are capable of critically influencing workforce demand on site as workers and capital are two primary inputs in the construction projects

(Ehrenberg and Smith, 2003). There is an inverse relationship between capital inputs and workforce required (i.e. more capital inputs will lead to less labour required), because automation, and mechanised equipment can serve as labour-saving activators.

*(c) Technological change*

Construction industry has imported a substantial amount of modern construction plant and machinery during the last two decades, resulting in a change in the employment structure of labour market (Chiang et al., 2006). The novel technological improvements with the purpose of increasing efficiency in the production process are likely to reduce the requirements of the workforce. For example, robots have been implemented in Japan's construction industry since early 1990s, leading to approximately 50% of workforce being replaced by automation (Cousineau and Miura, 1998).

*(d) Wage level*

According to a pragmatic viewpoint, another variant that may influence construction workforce demand is the wage level. In an open economy, high labour cost would reduce demand of workforce (Ross and Zimmermann, 1993). Ball and Wood (1995) argued that an increase in construction wages encourages construction firms replacing on-site labour in substituting with capital and prefabricated components. Ehrenberg and Smith (2003) further stated that employers have incentives in reducing cost by adopting technologies that rely more on capital and less on labour when wage increases.

## **2.2 Factors influencing the supply of construction workers**

### ***(a) Existing stock***

Workforce supply is principally governed by existing stock of human resources trained over earlier years (Briscoe and Wilson, 1993). Stock changes through time as retirement, deaths and transfer to other industries serve for reducing employment availability (Sing et al., 2012b).

### ***(b) Unemployed***

Existing stock can be alleviated by skilled labour currently unemployed with necessary skills (or skill mismatch), which can be attracted back into construction from other sectors of the economy.

### ***(c) New entrants***

To maintain workforce sustainability, attracting additional new people in joining the industry is essential even if it takes a few months or years to train them properly to new skilled workers. In this regard, the supply of workforce cannot be adjusted immediately to deal with labour demand (Nekkers, 2000).

## **3. Workforce transformation in developed economy**

Hong Kong has one of the world's most vibrant property and construction industries, which is critical to continue residential, commercial and infrastructural development. The industry had also made significant contribution to the economy, in terms of output and the share of the workforce involved (Yiu et al., 2004). A predominating feature of the



construction industry in Hong Kong is reinforced concrete applications – wet trade activities, which inevitably demands on the engagement of skilled workers such as steel benders and fixers, concreters and carpenters.

Workforce market in Hong Kong has undergone economic transformation over the past few decades (Legislative Council, 2012). It has been dominated by the knowledge-intensive work that has been accompanied by the pace of technological innovation and the continued development of services industries as the principle sources of jobs. Mason and Yamaguchi (2007) believed that such structural changes have created a generation-specific occupational distribution, with a high proportion of older workers in low-skilled occupations and a high proportion of younger workers in professional and technical occupations. Owing to the institutionalization of a 9-year universal education that is implemented in Hong Kong, labour force participation rate has decreased during the 1980s both for males and females (Suen, 1995). The education level of labour force in Hong Kong has steadily increased over the past thirty years, a continuation of a trend over the course of the twentieth century. The rise in educational levels has also enhanced workers' expectations of the constitution of a good job. For example, workers with additional education (especially younger workers) are more apt to seek the jobs that would provide greater opportunities for autonomy and control, in addition to being well paid (Kalleberg, 2011). Along with the increasing investment in the Hong Kong construction sector, a shortage of new comers has posed a threat to skilled workers sustainability in the construction industry.

#### **4. Research methodologies**

It is important to elicit perceptions and attitudes of the general public concerning job natures in the construction industry for maintaining workforce sustainability. Quantitative research method was thus adopted in this study. It is based on numerical measurements of specific aspects of phenomena and abstracts from particular instances in seeking general descriptions (Anderson, 2008). A street survey using the questionnaire was conducted at grass-root areas in Hong Kong for understanding the perceptions of the general public toward job characteristics of construction workers. The questionnaire designs to be short and simple for receiving high response rate (Kothari, 2004). Closed-ended questions were drafted in five-point Likert scales and multiple choices. The questionnaire consists of: (a) demographic information; (b) impression towards construction workers, (c) reasons why not consider to join construction industry; and (d) possible measures to encourage people in joining the industry. Questionnaire survey requires a minimum response rate of 30 per cent to produce reliable and convincing results (Knight and Ruddock, 2008). A total of 400 questionnaires were distributed to the targeted groups. Out of 150 successful responses, 125 were found to be useful and valid for the analysis. Therefore, a response rate of 31 percent was achieved. The demographic profile of the respondents is summarised in Table 1.

Table 1: Demographic profile of the respondents>

<b>(1) Age group</b>		<b>(2) Education attainment</b>	
20-30	34%	Primary school	25%
30-40	45%	Secondary school	50%
40-50	21%	University level or above	25%

## **5. Findings and discussions**

Ranking analysis is adopted to determine the significance of the selected themes. Questionnaire response were transformed to mean scores (with 1 denotes as 'not important at all' to 5 denotes as 'critical') in indicating the level of importance among the key themes. It includes: (a) characteristics of the construction workforce, (b) reasons for not joining construction industry; and (c) possible measures to increase workforce supply of construction workers.

### **5.1 Characteristics of the construction workforce**

Seven statements were given to the respondents in seeking their agreements on the characteristics of the construction workforce. The statement of "construction workers are contributing to the social development" is found at the highest ranking with a mean value of about 4.36 (see Table 2). The result supports the general public have recognised the importance of construction workers in the society and infrastructure development. The image of construction industry has been gradually improved since Hong Kong government's investment on enhancing promotion and publicity activities, which aims to uplift construction image (Legislative Council 2012). For instance, a 3-year intensive

publicity campaign, "Build up publicity campaign", has been rolled out through various media channels. The campaign's investment is up to a US\$ 2.5 million and includes giant outdoor banners on government buildings and public works sites, construction charity fund raising concert and documentary on the television channel as real life success stories of construction personnel.

Table 2: Impression of respondents toward the construction workers

Rank	Statement about construction workers	Mean score	Variance
1	They are contributing to the social infrastructure development	4.4	.79
2	They are professional technicians	4.2	.66
3	The job nature is dirty ('site environment')	4.081	.71
4	The job nature is unpleasant ('site environment')	3.874	.35
5	They are well-paid	3.069	.65
6	They are respectful	3.04	.23
7	Construction workers are underprivileged class	2.30	.45

Interestingly, the issue related to the working environment of the construction site is ranked behind "contribution to society" and "identity of professional technicians". This empirical evidence verifies the introduction of the advanced building technologies. Hong Kong has helped to improve site safety gradually by providing a clear and tidier site environment as well as eliminating site malpractices. The advanced building technologies have changed the traditional perception of the general public that the construction site is

dangerous and unpleasant. The industry's accident rate has substantially dropped from 114.6 per 1,000 workers in 2001 by about 50% to 52.1 in 2012 (Labour Department, 2012). The Government has also stipulated provisions in public works contracts, requiring contractors' supervisory staff to conduct daily inspections, and arrange the works departments' safety and environmental advisors in carrying out random and independent audit check for improving site operating environment, enhance construction site safety, and uplift site cleanliness and tidiness. On the whole, the respondents' impression towards the construction industry is positive.

## **5.2     *Reasons for not joining construction industry***

In order to nurture the new interests to the industry, reasons the general public are not entering the industry become important aspects for the government and training authorities. Respondents were asked to express their agreements on the importance of eight potential reasons. It can be identified from Table 3 that the high physical demanding and harsh working conditions in construction sites are their key barriers in joining the industry with mean values of 4.42 and 4.13 respectively. The majority of respondents (about 80%) believed that they were physically unqualified and unwilling to working conditions. Interestingly, salary is not their primary concern but employment instability, and insecure career prospect are other critical barriers for them in joining the industry.

Table 3: Reasons of general public not choosing to work in construction

Rank	Reasons	Mean score	Variance
1	It is a physically demanding work	4.42	.56
2	Tough working conditions in construction site	4.13	.91
3	High underemployment and unemployment rate in construction due to economic cycle	3.91	.92
4	Dimmed career prospects	3.85	.67
5	Work is not professional	3.25	.75
6	Construction sites are hazardous	3.14	.67
7	Construction workers is not decent	2.92	.89
8	It is not a good wage job	2.40	.99

### **5.3 Possible measures to increase workforce supply of construction workers**

Table 4 clearly summarises that the respondents are all concerned on how the government improves site working conditions and career promotion pathway for construction workers. Tight working conditions of construction workers in Hong Kong construction industry was listed in Table 5. To improve the working environment, the majority of respondents (about 75%) expressed that welfare facility on site for workers such as individual storage apartment, showering facilities and rest areas, should be provided. When temperatures and humidity exceeds the threshold limits for human well-being, a short break should be provided for construction workers. For example, a 15-30 minute break should be given in the morning, along with another 30 minute break in the afternoon.

Table 4: Measures to increase the workforce supply of construction workers

<b>Rank</b>	<b>Reasons</b>	<b>Mean score</b>	<b>Variance</b>
1	Improvement on site working environment	4.48	.40
2	Provision of career promotion pathway	4.02	.77
3	Provision on job stability	3.96	.70
4	High wage rate	2.74	.66
5	Importation of foreign workers	2.69	.75

Table 5: Job nature of the construction workers in the Hong Kong construction industry

<b>Outdoor</b>	For most of the time, construction workers have to work outdoor. In Hong Kong, summers comprises of 30°C to 35°C is also frequently accompanied with humidity levels as high as 80%. Salt egested with sweat left between joints would easily cause abrasion of muscles, which the workers suffer often.
<b>Danger</b>	Skilled workers such as bar benders, involves high amount of movement and handling of heavy and sharp rebar at height under the sun, thus bearing risk of getting cut, hit, sunburn, heat troke, skin cancer, and falling
<b>Unpleasant environment</b>	Toiling with sizzling and noisy machinery, breathing with dusty and odorant air, handling dirty and rusty rebar are undoubtedly uncomfortable.

Many skilful construction workers in Hong Kong were trained from the traditional informal master-apprenticeship scheme. They follow industrial informally agreed practices, for example, a 3-year apprenticeship under a particular skilled master and then becoming a registered skilled worker by completing trading tests and obtaining the qualification as

specified by the Construction Workers Registration (Amendment) Ordinance 2014. However, most construction workers are commonly poor-educated in the past and receive at most primary education (Vocational Training Council, 2013), some may not even be able to read nor write. Opportunities for construction workers to be promoted to a managerial role (e.g., site supervisors) are thus rare and limited. Oppositely, skilled workers with extensive work experience and top-up academic qualification could be much easily promoted to managerial level. A quick-witted worker could even be promoted to be a coordinator, working as a sub-subsidiary subcontractor for contract administration and taking up the overall supervision work. As such, promoting career progression ladder is one of the key factors for the local training authority to attract new practitioners.

Based on the survey results, maintaining the job stability is ranked as the third in attracting new additions. Most construction work around the world is portrayed as highly unstable activities because they require a long period of gestation and involve bulk monetary investment and loan arrangements (Goh, 2000, Rosenfeld and Warszawski, 1993). The initiation of construction projects is thus heavily dependent upon factors in the prevailing economic climate (Drewer, 1980, Lean, 2001). Moreover, infrastructure projects are frequently initiated by local governments to support societal developments, such as transportation systems, according to their policies. It led to that the Hong Kong construction industry is largely reliant on a multi-subcontracting system in dealing with fluctuating workload within the construction industry (Ng and Tang, 2010). A subcontracting system allows contractors to employ labour flexibly, though it may inhibit contractors from planning ahead, for example, engaging in human resource planning. The



subcontracting system could cause instability to labourers' employment. Under this multi-tier subcontracting system, contractors only hire workers for a particular project, which has a finite time. Once the project is completed, the workers are no longer required, and they are free to work elsewhere. As a result, this allows workers to move among contractors, and they may move out of the pool if they are not employed. It, usually, happens during a decline in the economy and causes higher employment instability of construction workers. The survey result had verified again that the multi-tier subcontracting system in Hong Kong remains to be the core issue that lead to the employment instability in the industry.

However, wage level and importation of workers are at the lowest ranks with the mean score of 2.74 and 2.69 respectively. The findings reflected that the wage level is not that significant in attracting people to join the construction industry. The Hong Kong construction industry has long been recognised as much superior in term of wage level to other industries with similar education attainment. Instead, public entities are focussed on the job stability and career prospect.

The Hong Kong construction industry has offered an attractive wage rate when compared with those of other industries in the past 20 years. The wage level in construction was relatively higher than other industries that possess similar labour entry requirements (Vocational Training Council, 2000b, Vocational Training Council, 2000a). Further, reviewing the history on real wage levels of the construction industry helps to explore that the wage index of construction workers was increased continuity between the period of

2006 and 2016 (see Figure 1). The increase in real wage also represents that the earning power of the construction workers is growing as the infrastructure development has commenced. A lot of low-educated people had been attracted in joining the industry because of its low entry requirement and relative high wage over the past 20 years. It can be inferred that wage level today is more attractive than other industries. Wage level is, therefore, not the fundamental concern of public entities, and they focussed on the job stability and career prospects as reflected from the questionnaire survey results.

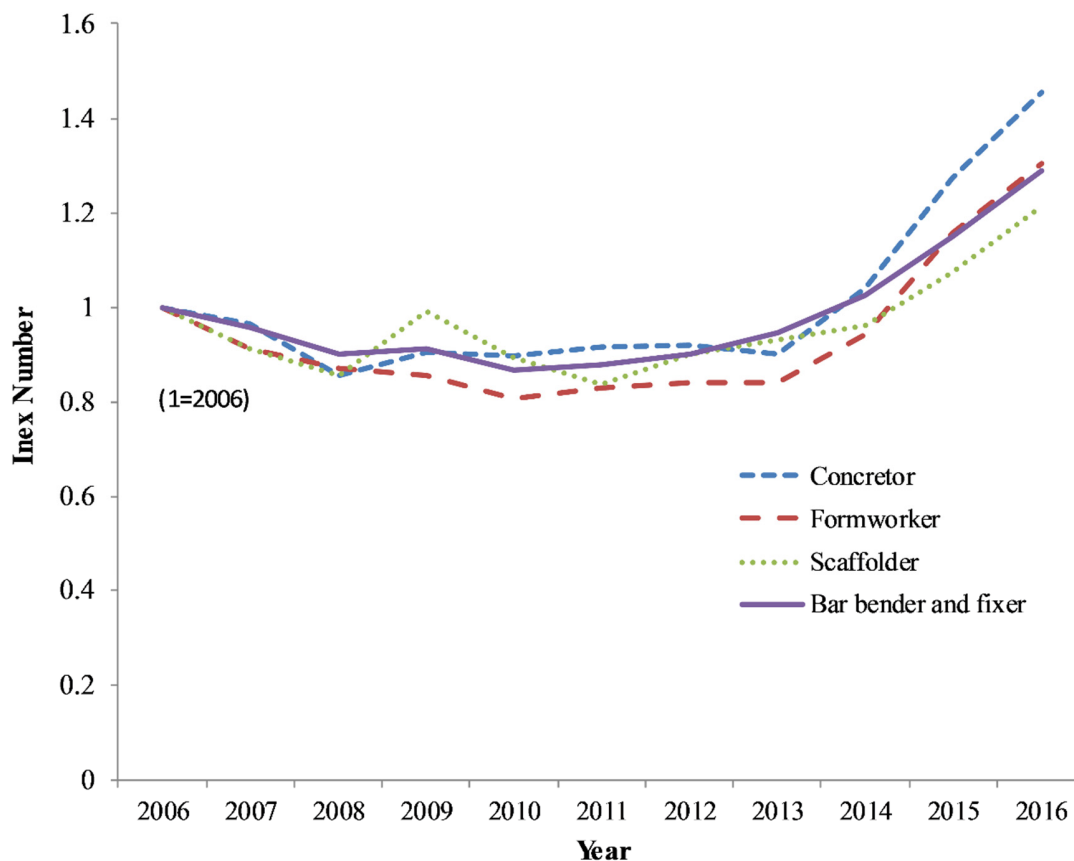


Figure 1: Wage index of construction workers engaged in public sector construction projects

Finally, most of the respondents considered that the policies of labour importation are the least appropriate solution in solving the workforce shortage problems in Hong Kong. They have highlighted that the flaws in using labour importation are: (a) reduction of job opportunities for local workers; and (b) downward pressure on local labour's wage. It is agreed that the importation of labour from other countries provides a quick solution to lessen the severity of an imminent labour shortage. However, public believed that the overall benefit to society and the economy, as well as the healthy development of the construction industry, should be the top priorities in determining whether to import labour. Pros and cons of a labour importation scheme are summarised in Table 6.

Table 6: Pros and cons of labour importation scheme to the society and the industry

Pros	Cons
(1) Quick solution to the fluctuating demands of the workforce in the construction industry	(1) Reduction of job opportunities for local workers
(2) Good control on the rise in wages and inflation	(2) Downward pressure on labour's wages
(3) High flexibility in increasing and disposing of the imported workers	(3) Discouragement for new blood to join the skilled trades which, in the long term, reduces the healthy development of the industry and thus, the society

#### **5.4 Ways to maintain the workforce sustainability in the construction industry**

Construction has long been acknowledged as craft-based industry since the early 1990s (Rowings et al., 1996, Agapiou et al., 1995). The industry was also characterised by

labour intensive and wet-trade activities, which has led to poor safety record (Poon et al., 2001). The use of prefabrication was strongly advocated in the late 1990 for improving site safety by providing cleaner and tidier site environment (Tam et al., 2007).

However, the study undertaken by Shen et al. (2002) and Tam et al. (2006) yielded that Hong Kong still relies on conventional construction techniques including concreting, bamboo-scaffolding, formwork and plastering. It is inferred that construction industry is recognised as wet-trade activities. This argument has been further verified from the questionnaire survey results administered to the general public in this study. On the basis of the issues identified in Table 2, majority of the respondents opted not to join the construction industry because of: (a) high-demand physical work; and (b) tight working environment in construction sites. The local training authorities should collaborate with trade association, labour union and stakeholders to promote the positive images of the construction industry to the public. As mentioned above, additional welfare facilities, such as showing facilities and rest area should be provided in construction sites. The site safety should be enhanced by introducing a regular site safety supervisor attended on site (Ju and Rowlinson, 2014).

Apart from the site conditions and safety record, career pathway and job security are also ranked at the top priority for the general in joining construction industry (Table 4). Government and local training authorities should investigate ways for enriching career pathways of the construction workers. For example, career pathway of the Hong Kong construction workers is shown in Figure 2. There are two main pathways for a new entrant

to qualify themselves as a skilled construction worker. It includes: (a) traditional master-apprenticeship; and (b) formal training from local training authorities such as the Hong Kong Construction Industry Council Training Academy (CICTA).

Currently, skilled workers can progress to managerial level (e.g., site supervisors) if they have extensive experience and academic qualifications. There are a number of part-time degrees and high diploma courses provided by local academic institutions, such as a diploma in building studies. Skilled workers, who have fulfilled the pre-requisite language requirements, could enrol in these courses. After obtaining an academic qualification, a construction worker may have a chance of promotion to the managerial level.

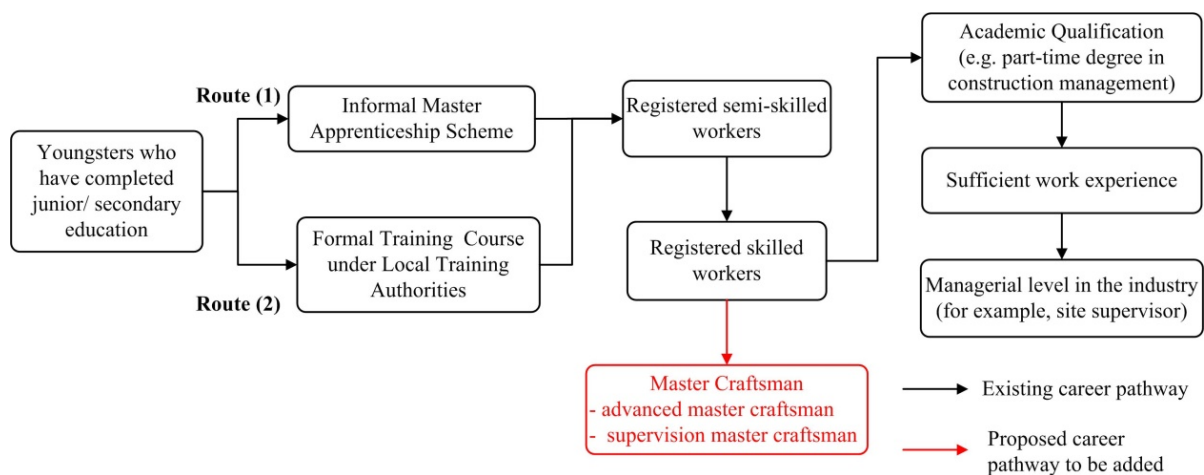


Figure 2: Career pathways for Hong Kong construction site workers

Under the existing career pathway, however, there is no ladder available for the experienced and skilled workers who do not possess academic qualifications to obtain a promotion. As such, the government and training authorities should review the existing pathways and offer suitable training for the workers to enrich their career prospects. To

enhance a career pathway for senior workers to be promoted to management level, it is necessary to launch a basic course to equip them with essential language and basic managerial skills for their promotion into management level. Upon gaining sufficient experience, they may undergo further supervisory level training courses in acquiring higher qualifications in managerial positions.

A refined framework should also be developed in defining workers' qualifications, having regard for the competencies they have acquired (which may encompass different proficiency levels for different technical skills). It may be worthy of considering a new pathway towards "Master craftsman": (1) advanced technical master craftsman; and (2) supervision master craftsman (Figure 2). Skilled workers could further develop their career paths by achieving one of the two streams, or both streams. The established clear and vibrant career path would help in attracting workforce in joining the industry. More importantly, the job instability of construction workers was resulted from the highly fragmented structure within the industry. The construction process requires input from a large pool of diverse workers with different specialised skills. In Hong Kong, there are over 60 skilled trades, such as concreters and scaffolders, in the registration system of construction workers (Hong Kong Construction Workers Registration Authority, 2010). Dabrah and Ofori (1997) noted that skilled operatives invariably worked in small gangs and undertook an independent set of tasks, which were of different duration and level of complexity. This results in many different trade workers being involved.

Table 7 compares some labour employment project requirements for residential buildings and highway construction, collected from main contractors. On the one hand, for the same contract value of HK\$1 million in new residential buildings, 2.51 man-days of concrete work were required, while, for highway construction projects, only 0.33 man-days were required. Thus, the types of construction projects to be procured would have implications on the skill requirements and easily lead to skill mismatch or imbalance. For example, depending on the project types, there would be a surplus of concreters but shortage of steel fixers.

On the other hand, subcontracting systems are widely adopted in the Hong Kong construction industry whereby it causes instability to the labourer's employment. Smith and Bartholomew (1988) suggested that the subcontracting system is convenient, economical and flexible in dealing with the fluctuating workload within the construction industry. Under this system, contractors only need to hire workers for a particular project, which has a finite period. The establishment of a multi-skilled construction workforce should be encouraged to enhance the employability of workers.

Table 7: Required skilled workers for the contract value of every US\$ 1million

<b>Type</b>	<b>Bar bender</b>	<b>Concreter</b>	<b>Drain-layer</b>	<b>Scaffolder</b>
Residential building	60.37	19.58	20.59	34.94
Highway construction	39.47	2.57	5.85	2.65

Note: The above figures are derived from the labour deployment records collected from anonymous main contractors.

The multi-skilling of construction workers is useful for regulating labour supply and is an important strategy for tackling workforce imbalance. The purpose of multi-skilling is to encourage the workers to be trained in more than one trade so that they can move among different trades where their skill is in demand. Upon obtaining the necessary skills, they could easily move to particular trades for easing shortages. Flexible training schedule arrangements could also attract those full-time workers who plan to move to another skilled trade. This would provide additional opportunities for workers to increase their skills' spectrum and respond to the changing needs of the industry. Construction unions should encourage workers in transiting to other trades in demand by updating the latest labour conditions and job opportunities.

As mentioned earlier, the overall benefit to the society and economy, and healthy development of the construction industry should be the top priorities in determining whether to import labour. The short-term benefit of the labour importation scheme is to offer a quick solution to the problem in labour shortages. It can help reducing job opportunities and wage levels of local workers. Hence, a labour importation policy should only be implemented after considering the following factors:

#### *Wage level*

Wage level is determined by the demand and supply conditions of labour, forming an equilibrium point in the labour market. A surging rise in wages will lead to inflation at regional or country level. The traditional economic thoughts are that moderate inflation is



healthy for society, but extreme inflation is harmful. Thus, when the wage levels soar, measures to increase labour supply need to be implemented.

### *Delay in construction projects*

In the case of the airport core projects in Hong Kong, timely delivery of the projects was essential to meet the deadline for the transfer of sovereignty on 1st July 1997. As a result, there was no other alternative, but the importation of labour to meet the tight construction schedule. This Act in Hong Kong, however, has been removed after 1997. The on-schedule delivery of infrastructure projects is, instead, tied to economic development and the influence of the Chinese economy. Hence, if there is no adverse effect on the local economy, these major infrastructure projects could be delayed in order not to aggravate the labour shortage problems.

The question of “Under what scenario, could non-local construction personnel be imported to work?” is complicated, and it is difficult to find a unique answer. Firstly, construction personnel need to be decomposed into different specific trades, each to be independently considered. Secondly, factors including skill mismatch, wage levels and possible delays in construction projects need to be simultaneously considered to come up with an optimal solution. Both the short- and long-term effects must be contemplated. Most importantly, the overall benefits to society, the economy and healthy development of the construction industry are the primary criteria in determining whether to import labour. The reduction of job opportunities for local workers will be a key issue and is politically sensitive.

The importation of labour, therefore, should only be considered when the wage level rises to an intolerable level and the delay of construction projects could negatively affect the overall development of society. In proposing any short-term importation of labour to tackle the short-term demand for workers in certain trades, decision-makers should take account of the related social impacts and other supporting services that the community needs to pay for. These include social security, effects on quality of work, possible deterrents to the new addition, and those returning from other industries due to suppression of wages, provision of accommodation, transportation, etc. A detailed social cost and benefits analysis needs to be carried out to highlight any possible uncertainties regarding these short-term policies.

## **6. Conclusions**

To ensure a smooth, effective and timely delivery of construction projects, it is critical to maintain a sustainable workforce for nurturing an adequate and skilled labour supply. This paper investigated perceptions and attitudes from the general public towards the Hong Kong construction industry using a street survey using closed-end questionnaire . The results revealed that the contributions of construction workers in the society development have been highly appreciated from the general public. However, the survey yielded that harsh working condition in the construction site and job instability, lack of career prospects are the major barriers for the general public restricting in joining the construction industry. In order to maintain the workforce sustainability, several recommendations were discussed and provided, including the encouragement of multi-skilling, provision of welfare facilities for construction workers, and importation of foreign workers. This paper

can provide significantly contribution to the body of knowledge by revealing general public's updated perceptions and attitudes to the construction industry. The findings can also provide a significant insight for the local government and training authorities in reviewing labour policies for maintaining construction workforce sustainability. While the study is limited to the general public in Hong Kong, it is recommended that further research should expand to other developed cities such as Singapore and Japan for showcasing comprehensive picture on the construction workforce around the world.

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